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DODPOPHM/USA/DOD/NADTR-91103

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PERFORMANCE ORIENTED PACKAGING TESTING
OF
WOOD BOX
FOR
MK 3 MOD 2 NAE BEACON

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APRIL 1991
FINAL

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91-04882



91 7 12 030

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Unlimited Distribution	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE				
4. PERFORMING ORGANIZATION REPORT NUMBER(S) DODPOPHM/USA/DOD/NADTR-91103			5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION NAVAL WEAPONS SUPPORT CENTER		6b. OFFICE SYMBOL (If applicable) 5053	7a. NAME OF MONITORING ORGANIZATION	
6c. ADDRESS (City, State, and ZIP Code) CRANE, INDIANA 47522			7b. ADDRESS (City, State, and ZIP Code)	
8a. NAME OF FUNDING / SPONSORING ORGANIZATION NAVAL WEAPONS SUPPORT CENTER		8b. OFFICE SYMBOL (If applicable) 705	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code) CPANE, INDIANA 47522			10. SOURCE OF FUNDING NUMBERS	
			PROGRAM ELEMENT NO.	PROJECT NO.
11. TITLE (Include Security Classification) (U) Performance Oriented Packaging Testing of Wood Box for Mk 3 Mod 2 NAE Beacon				
12. PERSONAL AUTHOR(S) Kerry J. Libbert				
13a. TYPE OF REPORT		13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 91-04-24	15. PAGE COUNT 8
16. SUPPLEMENTARY NOTATION				
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Performance Oriented Packaging Hazardous Materials Mk 3 Mod 2 NAE Beacon Lithium Hydride	
FIELD	GROUP	SUB-GROUP		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report discusses the testing of the wood box used for packaging Mk 3 Mod 2 NAE Beacons for conformance to Performance Oriented Packaging regulations. The beacons contain the hazardous material lithium hydride. Stack tests, drop tests and vibration tests were performed, and results were satisfactory.				
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
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INTRODUCTION

The current packaging configuration for the Mk 3 Mod 2 NAE Beacon consists of six beacons, each in a fiberboard inner pack, in a wood box. This pack was tested to ascertain whether it would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations Recommendations on the Transport of Dangerous Goods, ST/SG/AC.10/1, revision 6, chapters 4 and 9. A base level vibration test was also conducted in accordance with the rulings specified in the Federal Register/ Vol. 55, No. 246 / Friday, December 21, 1990 / Final Rule. The objectives were to evaluate the adequacy of the container in protecting the hazardous materials.

TESTS PERFORMED

1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.3. Both the outer container and the inner pack were tested. Three outer containers and one inner pack were used to complete the tests. The drop height was 1.8 meters and the drop sequence was as follows:

- a. Flat on Bottom
- b. Flat on Top
- c. Flat on Long Side
- d. Flat on Short Side
- e. One corner

The test was performed at ambient temperature ($70^{\circ} + 20^{\circ}\text{F}$). The contents of the container should be retained within its packaging and exhibit no damage liable to affect safety during transport.

2. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.6. Three different outer containers were used, each with a stack weight of 2200 pounds. Three inner packs were also tested, each with a stack weight of 800 pounds. The test was performed for 24 hours. After the allowed time, the weight was removed and the container examined. Any leakage, deterioration, or distortion which could adversely affect transport, reduce its strength or cause instability in stacks of packages is cause for rejection.



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3. Base Level Vibration Test

This test was performed in accordance with Federal Register/ Vol 55, No. 246 / Friday, December 21, 1990 / Final Rule. Three outer containers were loaded with inert beacons and closed for shipment. Each container was placed on a vibrating platform that had a vertical double-amplitude (peak-to-peak displacement) of one inch. The packages were constrained horizontally to prevent them from falling off the platform, but were free to move vertically, bounce and rotate. The test was performed for one hour at a frequency that caused each point of the container bottom to be raised from the platform 1/16-inch. A 1/16-inch thick metal strip was passed between the bottom of the container and the platform.

TEST RESULTS

1. Drop Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Base Level Vibration Test

Satisfactory.

DISCUSSION

1. Drop Test

After each drop the container was inspected for any damage which would be cause for rejection. During both the end drop and the corner drop, the end of the outer container was forced open, exposing the ends of the inner packs, but the beacons were contained within the inner packs. The outer containers damaged in the end and corner drops are shown in Figure 1. Since the inner packs were exposed, the inner pack was tested to the same requirements. After five drops of one inner pack, the pack remained intact, with no exposure of the beacon. The inner pack is shown in Figure 2 after the drop tests were completed.

It should be noted that the container tested is a combination package. The outer container passed the drop tests

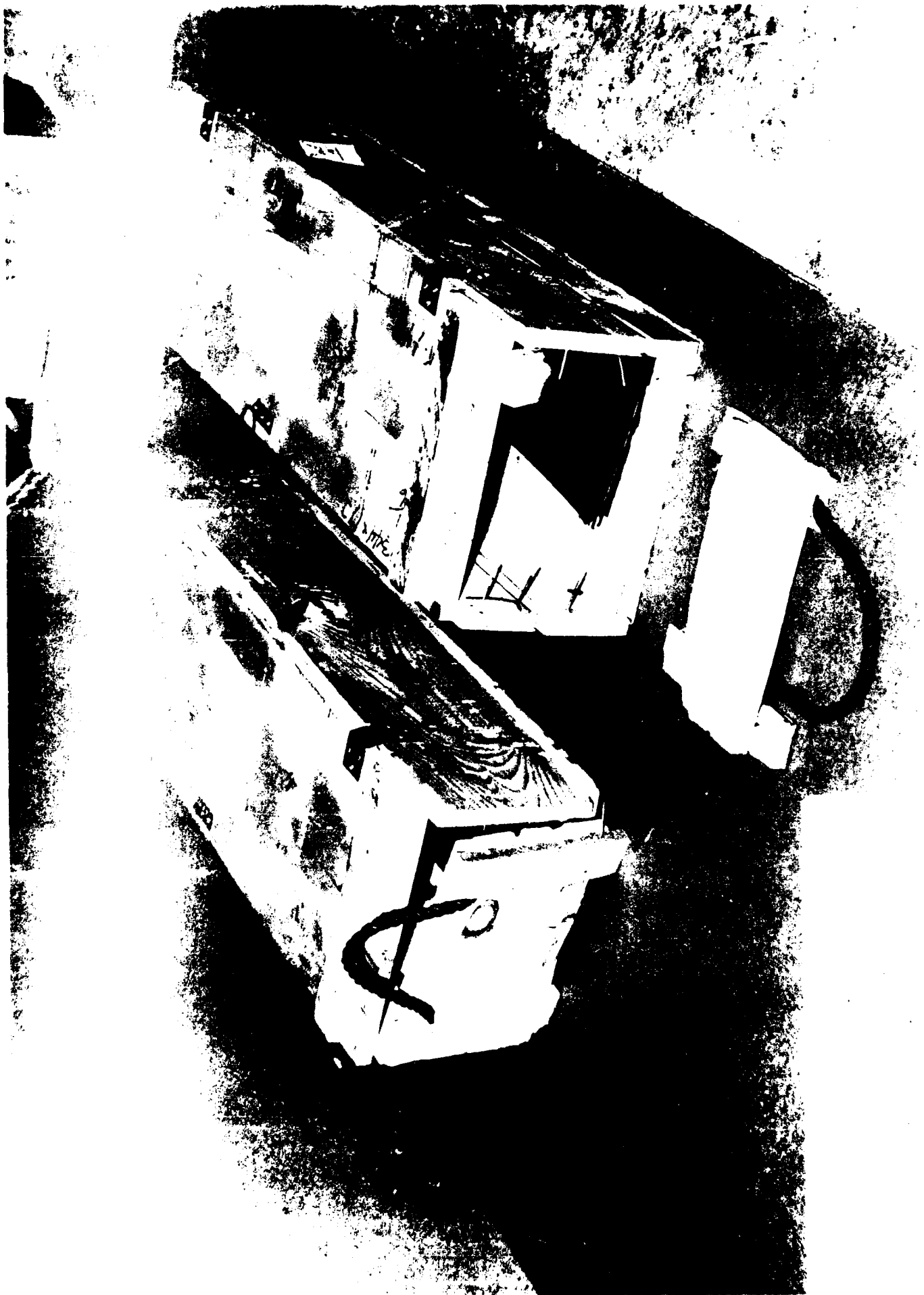




FIGURE 2.
Inner pack after drop tests. Pack
contains an inert MK 3 Mod 2 Beacon

in conjunction with the inner pack, and passed only because of the inner pack. Containers such as these should be evaluated with each item and inner pack transported in it, since its performance is based heavily on the inner pack.

2. Stacking Test

Three outer containers and three inner packs were individually tested. Each container and inner pack was visually inspected after the 24-hour period was over. There was no leakage, distortion, or deterioration to any of the containers or packs as a result of this test.

3. Base Level Vibration Test

Immediately following the vibration test, each outer container was removed from the platform, turned on its side and observed for any evidence of leakage. All latches remained fastened and there was no evidence of leakage of contents.

PASS/FAIL (UN CRITERIA)

The criteria for passing the drop test is outlined in paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g., a plastic bag), even if the closure is no longer sift-proof.

The criteria for passing the stacking test is outlined in paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages.

PASS/FAIL (FEDERAL REGISTER CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in the Federal Register / Vol. 55, No. 246 / Friday, December 21, 1990 / Final Rule and states the following: Immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. Rupture or leakage from any of the packages constitutes failure of the test.

CONCLUSION

The United Nations pass/fail criteria allows an outer container to pass the drop test if the inner pack retains the hazardous material. In cases such as the Mk 3 Mod 2 beacons, the MIL-B-2427 wood box passed the test only because the inner pack retained the beacons. Boxes of this type should not be used for transporting hazardous materials without a POP approved inner pack. Approval of this box for shipping the beacons should not be construed as an approval to ship any other items without approved inner packs.

REFERENCE MATERIAL

United Nations "Recommendations on the Transport of Dangerous Goods", ST/SG/AC.10/1, Revision 6

49 CFR Part 107, et al. Performance Oriented Packaging Standards, Federal Register / Vol. 55, No. 246 / Friday, December 21, 1990 / Final Rule

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DATA SHEET

CONTAINER: Wood Box for the Mk 3 Mod 2 NAE Beacon

Type: 4C1

UN Code: 4.3

Specification Number:
MIL-B-2427

Material:
Natural Wood

Capacity:
96.88 kg
(213 pounds)

Dimensions:
1.10 m (L) x .31 m (W) x .25 m (H)
(43.38" L x 12.25" W x 9.87" H)

Closure (Method/type):
Hasp

Tare Weight:
10.44 kg
(23.00 pounds)

Additional Description: Beacons packed in MIL-B-117 bag and
fiberboard box in accordance with drawing 53711-6204325.

PRODUCTS:

Beacon, NAE, Mk 3 Mod 2
NSN 5845-00-574-3442
DODIC 1W17

Proper Shipping Name:
Lithium Hydride

United Nations Number:
1414

United Nations Packing Group: I

Physical State: Solid

Amount Per Container: Six (6)

Net Weight: 12.94 kg (28.5 pounds)

TEST PRODUCT:

Name: Inert Mk 3 Mod 2 Beacons
Physical State: Solid

Size : .08 m Dia x .99 m L (3.00" Dia x 39.00" L)
Quantity : Six (6)

Dunnage: None

Gross Weight: 96.88 kg (213 pounds)